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tific museum or natural-history museum dare attempt, for a children's museum is for children rather than for nature or art.

Free organ recitals are given twice a week at the Museum of Science and Art in Glasgow, and these recitals have had a direct effect in increasing the sale of good music in competition with poor music. The *Bulletin of the John Herron Art Institute* in Indianapolis announces a musical program for Sunday afternoons in January. There may be other museums of science or art that have undertaken something similar.

There might be other kinds of museums than those in which people get benefit only through their eyes. Most of us have four other senses, hearing, feeling, tasting and smelling. I am not sure that I would as yet advocate a museum of odors, but a museum of sound might be not only interesting, but valuable. It might start with a victor-victrola. The records might include not only samples of the best music of the world by the world's great artists, but samples of the music of various kinds of instruments, of various kinds of mankind, as for instance, of the Negro, the Eskimo and the Chinaman, and of great oratory. On the other hand, there might be records for the city dweller who has never had a chance to hear such things as the lowing kine, the rattle of the rattlesnake, the yelp of the coyote, the songs of birds, rare or otherwise, the hum of a swarm of bees, the roar of the waves, the jingle of the chains of a wagon freight train, and the creak of ox carts. Bird songs are probably of as much interest to museum visitors as bird skins. Such a museum would probably be as attractive to the average citizen as a flower-garden or an art museum is to the European immigrants, who throng our great museums on Sundays and holidays to the noticeable shame of the lack of appreciation of many of the American born, who prefer a different recreation. It would be a great boon to some humble lovers of music to have a chance to hear, free of charge, examples of classical and the best modern music.

HARLAN I. SMITH

SCIENTIFIC BOOKS

The Quaternary Ice Age. By W. B. WRIGHT, member of the Geological Survey of Ireland. Illustrated. London and New York, Macmillan and Company. 1914. Pp. xxiv and 464. Price \$5.00.

The volume is opened by brief discussions (46 pp.) of glaciers and ice sheets and the glacial drift. Then follow in succession the glacial and associated features of the British Isles (56 pp.), the glaciation of the Alps (31 pp.), of northern Europe (25 pp.) and of North America (15 pp.), attention being given in each case to centers of ice dispersion and to general characteristics of the drift with more or less attention to relative amounts of weathering and erosion. The lakes of the great basin of the western United States are given a chapter of 23 pages. Then follow discussions of the loess (24 pp.), of the Quaternary Mammals (30 pp.), and of Quaternary Man (42 pp.). Two chapters, 33 pages, deal with theories of the Ice Age, and the insufficiency of any and all is declared. Four chapters, 101 pages, are devoted to the late Quaternary oscillations of level (interpreted in the light of the isostatic theory) in Fennoscandia, in the British Isles, and in North America. Following this and concluding the work are brief remarks on post-Glacial changes of climate in northwest Europe, on attempts at correlation of glacial drifts in the several fields, on the cause of loess deposition, on coincidence of present and preglacial sea level, and on low sea level during the Glacial Period with its effect on the Mediterranean and Straits of Gibraltar. The press work is good and the photographic illustrations excellent.

The author states in the preface that this volume was written because there is no general work in English to guide the geologist to the glacial literature and give him a grasp of the leading features of the subject. Yet no bibliography of the literature is appended and in only a few cases is full reference made to other writers. The author has seen, as yet, insufficient evidence in his study of the drifts

in the narrow field of the British Isles to convince him that there were distinct interglacial stages, and, unfortunately, he assumes that the evidence of such interglacial stages is inconclusive in any part of the world. In this and other matters he displays a distinctly sophomoric air. Thus on page 124 he announces:

"The elaborate systems of the older interglacialists may all be set aside as unproved. The class of evidence on which they were founded will not stand critical examination. For instance, the superposition of different sheets of till may at the most mean change in the direction of ice movement. The occurrence of interbedded gravels may merely mean local oscillations, or may be due to the natural formation of subglacial gravels between the ground moraine and englacial moraine. Fossiliferous beds between beds of boulder clay, unless they are clearly proved to be still in the position in which they were deposited, may have been caught up from the preglacial floor. The greater weathering of the older drift sheet may have been effected while the newer sheets were being deposited. It will thus be seen that it is a distinctly difficult thing to prove an interglacial period. We must, however, as Mr. Lamplugh has long maintained (Presidential Address to the Geological Section of the British Association, 1906), get back to solid ground in this matter before it is possible to make any real advance. There have been altogether too many speculations and too many loose correlations from place to place in dealing with this problem. We are bound to take our stand on the comparatively simple monoglacial hypothesis until we can prove at least one interglacial period. It will then be time enough to proceed to consider further possibilities."

That there are glacialists in the world who have been carefully considering all these matters in a long experience in field studies, and have been properly evaluating the field evidence, seems not to have dawned upon the author of this volume.

The contrasts in the amount of denudation displayed by the older and newer drifts of the

British Isles is clearly set forth by the author, but he takes the position that these contrasts can not be used as a time measure because climatic conditions have not been uniform. It is probable, however, that in the British Isles, as in other glaciated districts, a careful study of drainage features would serve to make clear whether a given valley had been formed rapidly by a larger stream than the present drainage line, and especially if it was in use as a line of glacial drainage. The work of streams which headed in the ice sheet may thus be compared with that of contemporary streams which had no contributions from the ice. Comparison may also be made between the work along a given drainage line accomplished by glacial drainage, and that accomplished after the ice had ceased to contribute water to it. To set aside as of no value studies of weathering and erosion of drift sheets, as is done in the quotation given below, seems a departure from the spirit of true scientific investigation. The following statements appear on pages 75-76:

"The southern boulder clay plains are extensively dissected by a system of valleys which have for the most part come into existence since the abandonment of the district by the ice. These valleys frequently trench through into the underlying rocks, and the boulder clay thus comes to occupy the interstream areas. When, as for example in Nottinghamshire, the underlying rocks are exceedingly soft and denudation has been especially severe, more extensive removal of the surface has resulted in the drift only remaining as a capping to more or less isolated hills.

"This extensive denudation and maturity of drainage which characterizes the older drift is suggestive of a very considerable lapse of time since its exposure to subaerial erosion. Moreover, the denudation exhibited by the more northerly drift is trivial in comparison. We might draw from this the conclusion that the interval between the laying bare of the older and newer drift was immensely longer than post-glacial time were it not that we have to do with very different climatic conditions in the two periods. There is every reason to

believe that the climate of the districts fringing the ancient ice sheets was of exceptional severity, and that denudation must have proceeded with much greater vigor during the later stages of the Ice Age than under the more temperate conditions of the post-glacial period. It would, in fact, be a great mistake to accept denudation as a measure of time, when we are dealing with such variable relations of temperature and precipitation as appear to characterize the Quaternary.

"In the present state of our knowledge it is impossible to draw a definite line separating the older and newer drifts. Large areas can, however, be distinguished as belonging to one sheet or the other."

Notwithstanding these statements, a text figure is introduced on the same page (p. 76) outlining the probable limits of the glaciation represented by the newer drift of the British Isles. Also on pages 78-81 an interglacial shell-bearing clay at Kirmington, in North Lincolnshire, is discussed in detail and shown to be both overlain and underlain by boulder clay. There is no question that the stratigraphic relations are primary and undisturbed. The author, however, endeavors to guard the reader against making too much of this section, for he says, page 81:

"The extent of this 'interglacial' retreat need not have been very great and we have very little evidence as to its duration. That it was, however, something more than a mere oscillation of the retreating ice margin seems to be indicated by the marked difference in denudation exhibited by the older and newer drifts."

The author appears to have been sufficiently impressed by the work of Penck and Brückner in the Alps to accept their interpretation that there was a fourfold repetition of the foreland glaciation. He even goes so far as to present the diagram (Fig. 48) by Penck, representing the supposed relative length of the postglacial and interglacial stages. Concerning "Die Alpen im Eiszeitalter" by Penck and Brückner, he states that this marvelous work gives us a glimpse into what may possibly be effected when its exact method and acute reasoning come to be applied to other districts.

In the discussion of the glaciation of North America 15 pages are deemed sufficient to cover this most extensive of the fields of Pleistocene glaciation, in which the several drift sheets are more broadly exposed to view than in any other field, and in which the incisive methods instituted by Chamberlin have been actively carried on for over 30 years. No mention whatever is made of the oldest drift sheet, the pre-Kansan or Jerseyan, or of the mammalian remains found in the Aftonian beds which separate the pre-Kansan from the overlying Kansan drift, and which show clearly that conditions favorable for the existence of large herbivorous mammals prevailed. The Kansan, Illinoian and Iowan drift sheets are thrown together as "extramorainic," while the Wisconsin drift is classed as "intramorainic." The fact that the Illinoian drift is morainic at its border in southeastern Iowa and western Illinois, and that it embraces several recessional moraines, seems to have escaped his attention. The loess he makes use of to mark the separation between the "extramorainic" and the Wisconsin drift, the former drift being covered by loess, except a part of the Iowan, which he thinks should have been covered by it—in order, perhaps, to simplify matters for monoglacialisitic interpretation.

The conclusion is drawn on page 167 that the whole American classification is ready to go to pieces because certain American glacialists have expressed doubt concerning the Iowan drift. The "agnosticism" which a few British glacialists have come to feel on the interglacial question is interpreted, without justification, to have pervaded the entire rank of glacialists in Europe in their attitude toward the northern drifts, the following statement being made on page 167:

"It is interesting to note that the apparent ease and definiteness with which the Americans have read the records of their glacial deposits is gradually becoming reduced to a state of agnosticism very similar to that of the European glacialists toward their northern drifts."

The supercritical spirit displayed in refer-

ence to the interpretations of interglacial stages both in Europe and America is laid aside when discussing the late glacial changes of level. In regard to these the author states that the Americans have carried out a series of researches on the shore lines around their lakes which rival in interest the magnificent results obtained by the Scandinavians. The author refers the uplift to the disappearance of the ice weight. He seems not to have reached the state of uncertainty on the question of the effect of the relief from ice weighting which certain Americans most closely connected with this investigation are experiencing.

The chapter on the Quaternary mammals is mainly descriptive, though they are listed as representing four classes, those characteristic of arctic tundras, of the steppes, of present-day southern distribution and extinct mammals.

The chapter on Quaternary man brings out the several stages of culture in accordance with the results of European investigations, and seems favorable to the correlation of certain stages of culture with late stages of the glacial epoch.

FRANK LEVERETT

ANN ARBOR, MICHIGAN

Biologie der Fische. VON DR. PHIL. OSKAR HAEMPEL, Privatdozent an der k. k. Hochschule für Bodenkulture in Wien. Mit 55 Abbildungen im Text. Stuttgart, Verlag von Ferdinand Enke, 1912.

Attractively bound in true German style, this little volume appears as a separate from Dr. M. Hilzheimer's work on the "Biologie der Wirbeltiere." The author disclaims completeness, his object having been to put forth merely a guide or introduction to the biology of fishes. There is more information, however, than he would have one believe; much more, in fact, than can be found in any single American work on the subject.

The contents are grouped under three headings, namely: (1) A general review of the anatomy and physiology, (2) the dependence of fishes upon the chemico-physical conditions

of habitat, (3) life manifestations of fishes with respect to other organisms.

The lateral line whose function is not well understood even at the present time has been studied and reported upon by at least one prominent American zoologist, but it has been considerably neglected by authors of general works. The adequate manner in which it is treated by the present writer is to be commended.

Literature concerning the food, feeding and digestion in fishes is widely scattered and in many cases unavailable to the student of animal ecology or of fish culture. Barring Dr. Forbes's admirable papers on the food of fishes, it can be said, also, that much of the published data are erroneous or at least that they give but a hazy notion of this important subject. Dr. Haempel here presents a full and most interesting account which evidently is the result of careful selection of those facts of practical importance.

The study of the breeding habits of fishes constitutes a large field of great diversity, one which has been surveyed but casually so far as American forms are concerned. And so, perhaps wisely, the author of the present work has confined his attention to the habits of European fresh-water forms and to the better known among marine fishes. His examples illustrating the various types of breeding are well chosen.

When one learns that the author was a former student of the well-known authority on fish diseases, Dr. Bruno Hofer, and in fact to whom this book is dedicated, it is a little surprising that this phase of fish biology is not treated more fully. The criticism may be favorable, however, in view of the fact that the work is designed merely as a guide.

It is unfortunate to find lancelets treated in a work on the biology of fishes, for they are not fishes and their inclusion necessitates many exceptions to the general statements.

The author is a teacher of fish culture as well as an ichthyologist and he has kept prominently before the reader the practical application of ichthyologic data. This is emphasized particularly in the sections dealing with